

AUTOMATED TRASH DISPOSERY AND ANALYTICAL SYSTEM USING IOT

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ABSTRACT

Nowadays certain actions are taken to improve the level of cleanliness in the country. People are getting more active in doing all the things possible to clean their surroundings. Various movements are also started by the government to increase cleanliness. We build a system which will notify the corporations to empty the bin on time. In this system, we automate process by using Internet of Things (IoT) using wireless sensors. When the garbage reaches the maximum level, a notification will be sent to the corporation office, and then the employees can take further actions to empty the bin. The notifications are monitored by applications using data analytics. This system will help in cleaning the city in a better way. By using this system people do not have to check all the systems manually but they will get a notification automatically when the bin gets filled.

Key Words: *Internet of things (IoT), Wireless Sensors, Data Analytics.*

INTRODUCTION

Environmental problems are raised by modern cities for waste collection and disposal. Therefore, smart waste management systems became essential for cities that aim to reduce cost and manage resources and time. Currently, the trend is shifting towards smart devices and internet of things (IoT) solutions to overcome common problems such as waste management issues. IoT or Internet Things refers to the network of connected physical objects that can communicate and exchange data among themselves without the desideratum of any human intervention. Internet of Things is a new revolution of the Internet. The goal of the Internet of Things is to enable things to be connected anytime, anyplace, with anything and anyone ideally using any path/network and any service. It can be scaled with sensors as we require. IoT allows devices to generate and exchange data. IOT aims at facilitating human by reducing their efforts. IOT helps in automation of equipment to an extent. The connected devices in the network will have a Unique Identifier (UID).

The scope of IoT has grown tremendously as currently it consists of more than 12 billion connected devices and according to the experts it will increase to 50 billion by the end of 2020. With the advent of IoT both manufacturers and consumers have benefited. Manufacturers have gained insight into how their products are used and how they perform out in the real world and increase their revenues by providing value added services which since then enhances and elongates the lifecycle of their products or services. Consumers on the other hand have the ability to integrate and control more than one device for a more customized and improved user experience.

In India collection, transportation and disposal of waste is unscientific and chaotic. The waste workers have to inquire about each bin on several spots at different cities. Trips cannot be planned in accordance with the need. This is a time consuming and wastage of fuel in the garbage can. There are systems which take data from bins regarding garbage level, but the smell remains a problem. If the level is not filled it will not bother about the smell. Smell raised from waste bin can cause pollution as well as spread

diseases. In the present scenario with the development of advanced technologies waste management ought to have improvements. To tackle these problem an effective solution, the proposed IoT based waste management system is being introduced.

NEED FOR SMART TRASH BIN

Although the world is in a stage of up gradation, there is yet another problem that has to be deal with is Garbage. Dustbin is a basic and common need everywhere. Many times it is observed that garbage bins being overfull and the garbage being spilled out from the bins around us. This leads to various diseases as large number of insects and mosquitoes breed on it. Breeding of these mosquitoes causes various diseases like malaria, dengue etc. Majority of viruses and bacterial infections develop in polluted environment. Safeguarding the environment using technology sources is needed at present. Majority of the public environment seems to be polluted with the waste material. A big challenge in the urban cities is solid waste management. Now with rise of technology it is high time to use technology for waste management. Hence, smart dustbin is a system which can eliminate this problem or at least reduce it to the minimum level. Our present Prime Minister of India, Sri Narendra Modi ji has introduced the concept of implementing 100 smart cities in India. “Swachh Bharat Abhiyan” was initiated to ensure a clean environment. Majority of viruses and bacterial infections develop in polluted environment. Safeguarding the environment using technology sources is needed at present. Majority of the public environment seems to be polluted with the waste material. So, modernization of the dustbins is needed by imparting the smart technology.

LITERATURE REVIEW

The most current related work is done by Zavare and his colleagues on sensor nodes connected to an Arduino board based control station that uses a GSM module to send the sensor nodes data by SMS to the garbage collecting vehicle and to a server hosting web application by a Wi-Fi connection.

A report was done by students of California Polytechnic State University, thoroughly exploited the economic and power consumption aspects of converting a conventional outdoor trash bin into a smart one. According to the literature, the project is based on u-blox C027-U20 microcontroller board, which has built-in GPS module and cellular module. The board is used to control HC-SR04 ultrasonic sensor that measures the bin's fullness-level and a temperature sensor for monitoring weather conditions and fire alerts. The setup is contained by 2×4×6 plastic box and powered by a 12V rechargeable lead-acid battery. The report mentioned that the system generates an HTTP POST request using the data from the sensors and send it to a web application, which is built using Python and Flask framework on top of an SQLite database. The web application receives the HTTP request and checks if the bin is full then send SMS message using Twilio service. Moreover, Leaflet JavaScript library is used to virtualized the collected data on a map. In summary, most of the papers above did not focus on covering the overall cost and power consumption of the system, which are the main issues tackled by this paper.

PROPOSED SYSTEM

In our proposed system, we have a ultrasonic sensor at the top of the bin which is used to detect the level of the waste in the bin. Whenever a bin gets filled, notification will be send to the workers. This notification will be monitored by our application. If the bin is not emptied within the specific time, then the notification will be again send to the workers. If the bin is not emptied even after sending two notifications, then the application will send a notification to higher authority. Increase in waste leads to many health problems. Our proposed system also have UV light in the top of the bin which is used to kill the micro-organisms and provide an odour free environment.

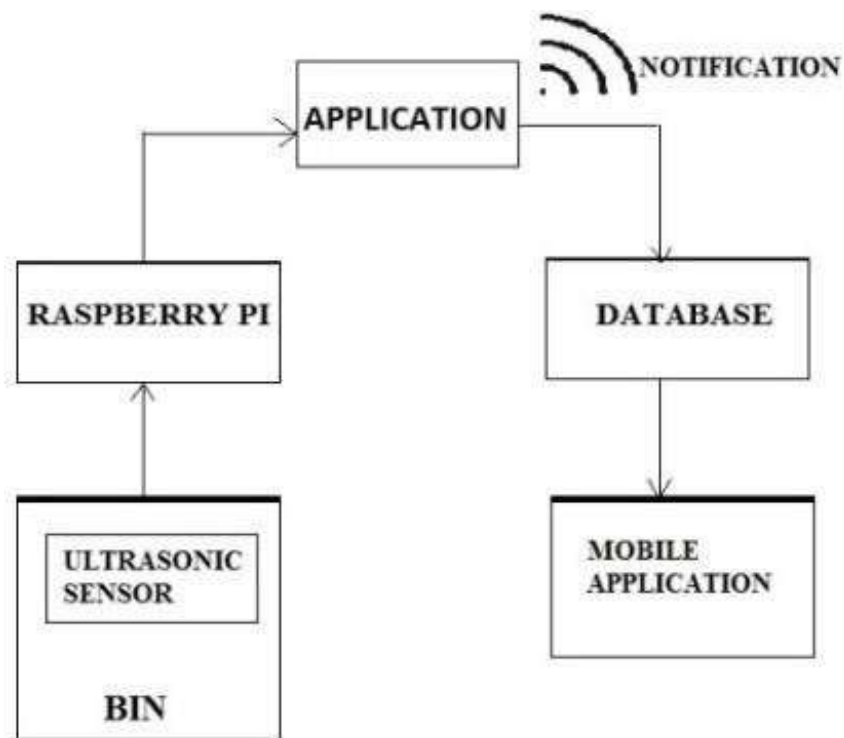


Figure 1: System Architecture

HARDWARE RESOURCES AND FEATURES

Ultrasonic sensor

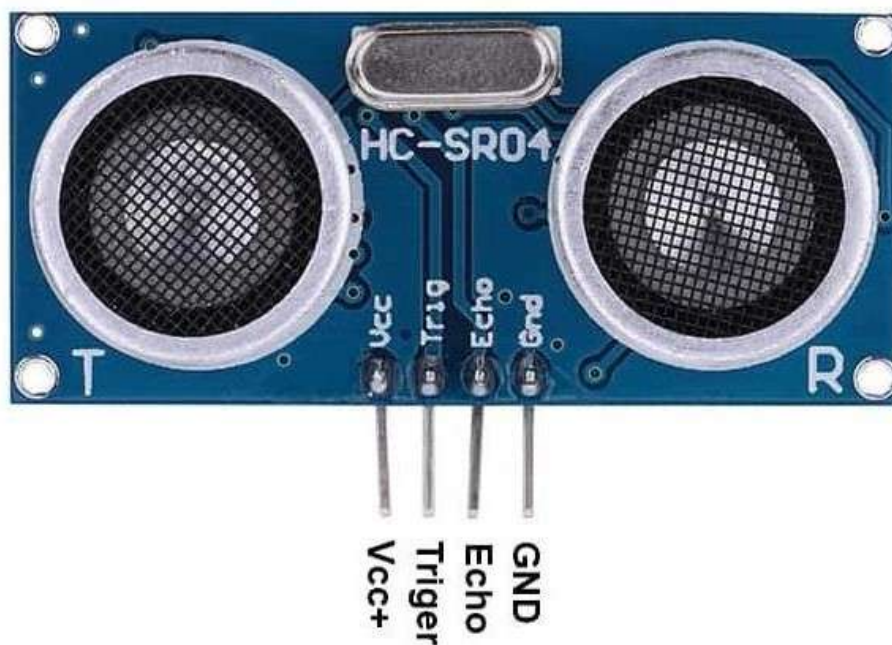


Figure 2: Ultrasonic Sensor

Ultrasonic sensor measures the distance by using ultrasonic waves. It emits an ultrasound wave at the frequency of 40KHz. The sensor head emits an ultrasonic waves and receives the wave reflect back from the target. Ultrasonic sensor measures the distance of the target by measuring the time between the emission and reception of ultrasonic waves. The distance is calculated by using the formula ($L=1/2*T*C$), where L is the distance, T is time between the emission and reception of waves and C is the sonic speed. Ultrasonic waves can reflect off a glass or liquid surface and return to the sensor head, even transparent targets can be detected. Detection is not affected by accumulation of dust or dirt.

It is a 4 pin module, namely VCC, Trigger, Echo and Ground. It includes a transmitter, receiver and control unit. VCC of ultrasonic sensor will be connected to VCC(pin 2) of the raspberry pi and Ground of ultrasonic sensor will be connected with Ground(pin 6) of raspberry pi. Trigger pin will be connected to GPIO18(pin 12). Echo will be connected to GPIO24(pin 18) through 330Ω resistor or Ground(pin 6) through 470Ω resistor. Signal from the ultrasonic sensor will be sent by Trigger pin and received by Echo pin. The ultrasonic sensors commonly used with Arduino, Raspberry Pie etc. It can measure distance from 2cm to 400cm.

UV lamp



Figure 3: UV lamp

UV lamp contains a small amount of mercury within the lamp tube. When current pass through the lamp, mercury will get excited and emits UV light. This UV light kills the micro-organisms by generating ozone gas inside the bin and it helps to provide odour free environment. UV light is placed on the top of bin. Once the bin's lid is closed, the UV light gets activated to eliminate odour. It continues for every 60 minutes while the bin is not in use in order to provide an adequate ozone level.

Raspberry pi



Figure 4: Raspberry pi

The **Raspberry Pi** is a low cost, credit-card sized computer. It is a series of small single board computers. Processor speed ranges from 700MHz to 1.4MHz on board ranges from 256MB to 1GB Random Access Memory (RAM). It is like a brain because it has more computational power. The voltage will be increased and decreased by using pulse width modulation. It has more Ios. It is integrated with central processing unit (CPU) and graphics processing unit (GPU) on a chip.

DATA ANALYTICS

Data analytics is a process of inspecting, cleansing, transforming and modelling data with the goal of discovering useful information. Especially in today's data-driven world information has been considered as a great weapon. It changes everything, not just in the world of business, but also in sports, science and about any field where vast amount of data are collected. Analytics lead us to find the hidden patterns in the world around us from consumer behaviours, athlete and team performance, to finding connections between activities and diseases. Sometimes we think that a process is already working as its best, but sometimes data tell us otherwise, so analytics help us to improve our world. A graph has been generated based on filling status of the bin. This daily report help us to analysis which area is generating more non-degradable waste. Based on the report, we can create awareness among the specific area people. It is also helpful for the recycling companies to choose the area depend upon the waste generate that may be degradable or non-degradable.

RESULTS



Figure 5: Smart bin with ultrasonic sensor UV lamp

Figure 5 shows a complete circuit of automated trash disposal using IOT Smart. Raspberry pi, ultrasonic sensor and UV light are the different hardware components used in this circuit. The ultrasonic sensor is used to detect the amount of waste by calculating the distance level and the UV light is used to kill the micro-organisms and provides an odour free environment. Application is developed to monitor the data.

CONCLUSION

In this project the implementation of automated trash disposal and analytical system using IOT as a hardware and ionic framework as our software insures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned on in specific time, then the record is sent to the higher authority in our case the admin who can take appropriate action against the concerned employee. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. The smart garbage management system makes the garbage collection more efficient. Thus a hygiene and clean environment can be provided. This survey

helps in identifying all possible smart garbage management methods that can be implemented to make city clean.

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